EAST NAVIDAD RIVER BRIDGE
Texas Historic Bridges Recording Project II
Spanning the East Navidad River at FM1579
Schulenburg vicinity
Fayette County
Texas

HAER No. TX-79

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C St. NW
Washington, DC 20240

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HISTORIC AMERICAN ENGINEERING RECORD

EAST NAVIDAD RIVER BRIDGE HAER No. TX-79

Location:	Spanning the East Navidad River ~~2.4 miles east of intersection U.S. 90~~ AT FM1579 Schulenburg vicinity Fayette County, Tex. UTM: 14/708422/3285405 USGS Quad: Weimer, Tex. (7.5-minute series, 1961)
Date of Construction:	1921-1922
Date Opened:	1923
Designer:	A. T. Granger, Texas Highway Department
Present Owner:	Texas Department of Transportation
Present Use:	Roadway bridge
Significance:	One of only a small number of concrete cantilever bridges constructed by the Texas Highway Department, this 199' long bridge also has unusual ornamental concrete railings.
Historian:	Peggy Hardman, Ph.D., August 2000
Project Information:	This document was prepared as part of the Texas Historic Bridges Recording Project II performed during the summer of 2000 by the Historic American Engineering Record (HAER). The project was sponsored by the Texas Department of Transportation (TxDOT), Environmental Affairs Division.

INTRODUCTION

The East Navidad River Bridge consists of two-curved cantilever arms supported on skewed concrete piers and abutments. The 70' long center arch span is flanked on either side by curved anchor arms. Simple concrete slab and girder spans serve as approaches at each end of the bridge. The 199' long bridge has a total width of 21'-2", providing an 18' wide roadway. Modification of the Texas Highway Department's Type C rail design allowed construction of the open-style railing consisting of a concrete post (positioned 5'-10" apart the length of the bridge) and two-beam rail divided into sections by battered concrete pedestals.[1] A. T. Granger, designer, incorporated incised panels and chamfered edges. The ornamental features are consistent with the evolving style of the period that bridges, including those in "remote country districts," warrant "careful and artistic . . . design."[2]

ENGINEERS AND DESIGNERS

The East Navidad River Bridge, a joint Fayette County - State of Texas project (State Aid Project No. 256 A), originated with the Federal Aid Act of 1921 to improve sections of highway in Fayette County.[3] The following employees of the Texas Department of Highways participated in the project: State Bridge Engineer George Wickline; bridge designer, A. T. Granger; and J. B. Kearby.[4] The department contracted Schulenburg bridge builder and engineer Lake Robertson to serve as Resident Engineer. Two name plates, located on the inside of the end rail posts over abutment bent shafts at each end of the bridge, also identify Fayette County Commissioners and Texas Highway Department engineers involved in the project.

A. T. Granger departed from traditional concrete construction methods. Possessing an artistic bent, he created a structure in harmony with the picturesque countryside of the East Navidad River, and pleasing to the eyes of motorists passing through the Schulenburg area as

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[1] Texas Department of Transportation, *Historic Bridge Inventory*, 31 August 1999.

[2] Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, "Big Conestoga Creek Bridge No. 12,"

[3] Joseph E. King, *An Historical Overview of Texas Transportation, Emphasizing Roads and Bridges*, Lubbock, Texas: Center for Historic Preservation and Technology, Texas Tech University, n.d.

[4] According to the Texas Department of Transportation Human Resources Division, Granger worked as a "draftsman."

they traveled the Old Spanish Trail (State Highway 3). The new bridge replaced a smaller metal truss with a timber deck at the crossing.[5]

The novelty of Granger's design caused engineers with the United States Bureau of Public Roads to write to State Bridge Engineer, George Wickline offering advice on construction methods, and some design aspects. This letter is on microfilm at the Texas Department of Transportation, but is partly unreadable, because of deterioration of the film.[6] What can be discerned are worries about the structural integrity of the bridge. Engineers with the Bureau worried that if the structure size required main girders to be poured in several operations, rather than once, construction joints might weaken over time. They even went so far as to admonish Wickline and Granger as to placement of drain holes at "10'-12' apart . . . symmetrically" along the span.[7] Whether or not the Texas engineers adopted all of the suggestions is not known, but bridge plans drawn up by Granger offer numerous cautionary statements about the pouring of the concrete.[8]

Wickline was chosen to be the first State Bridge Engineer of the newly created Texas Highway Department in 1918, where he held the post until his death by myocardial infarction in 1943. George Grover Wickline, born in Stephenville, Texas, on 5 January 1883, attended public schools in Stephenville, and college at John Tarleton State; in 1904, he received a degree in civil engineering from the University of Texas at Austin. He learned first hand all aspects of bridge and road engineering by working as a survey crew member or assistant engineer for various railway companies, and as a bridge engineer or resident engineer for several city and county governments. Wickline spent most of his career in Texas, but between 1906 and 1908 worked as a draftsman, designer, and assistant engineer on California's Owens Valley aqueduct; a huge project designed to bring water from the Valley to Los Angeles.[9]

Wickline became a member of the Texas State Board of Professional Engineers in 1937. As state bridge engineer for the Texas Highway Department, Wickline oversaw the Bridge

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[5] A picture of the original bridge may be seen on the cover of *Texas Highway Bulletin* 2, No. 10 (December 1922).

[6] Project correspondence file, Fayette, F-276, on microfilm, Texas Department of Transportation, records Management Division, Austin, Texas.

[7] Project correspondence file, Fayette, F-276.

[8] Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, "East Navidad River Bridge," No. TX-79. Fieldnotes contain Texas Highway Department Plan and Profile of Proposed Texas Highway Bridge over East Navidad River, 1922.

[9] George G. Wickline, "Application for Registration to Practice Professional Engineering," 8 December 1937. Texas State Board of Registration for Professional Engineers, Austin, Texas.

Division, and helped develop standards for bridge construction on the state's highway system. He took one leave of absence from his post. Between 1936 and 1938, he supervised the construction of the Rainbow Bridge over the Neches River at S. H. 87 between Orange and Port Author.[10] Wickline probably felt comfortable with A. T. Granger's design for the East Navidad River structure; there is no correspondence between the two to indicate otherwise.

More research needs to be completed about designer, A. T. Granger. According to employment records at the Texas Department of Transportation, he worked as a "draftsman" for a short period terminating 15 September 1921, when he "resigned." In that brief association with the department, Granger, between 21 July and 2 September 1921, drew plans for the East Navidad River Bridge.[11] The reason for his resignation is not revealed in any project correspondence or employment records.

Born in Brownwood, Texas, Resident Engineer on the project, Lake Robertson, moved to Schulenburg already established as a bridge designer and builder. He built bridges on the Old Spanish Trail spanning Foster's Creek, the East and West Navidad River, and worked as a sub-contractor on the bridge spanning the Colorado River at La Grange, Texas. Upon completion of the East Navidad River Bridge, Robertson and his family moved to San Antonio, then to the Kerrville area where they purchased the "Heart of the Hills" resort. Robertson lived there until his death in February 1936, at the age of forty-four; burial took place at the City Cemetery in Schulenburg.[12]

Schulenburg residents grieved for their lost friend, but believed his "memory shall live on.[13] In the unique bridge spanning the East Navidad River on Old State Highway 3 (FM 1579), Robertson, Granger, and Wickline all continue to influence the Schulenburg community of Fayette County, Texas.

Fayette County is sixty miles Southeast of Austin, Texas, in the Blackland Prairies region of south central Texas. The county is bisected by the Colorado River since pre-history. Indian, Spanish explorers, and later Anglo settlers traveled through the area, attracted by good water and soil. The first known Anglo settlers, Aylett C. Buckner and Peter Powell, established a trading post on the La Bahia Road just west of La Grange. In 1837, the Republic of Texas responded to the petition of residents in the area and established the county of Fayette in honor of the Marquis

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[10] Wickline, "Application for Registration to Practice Professional Engineering,"

[11] Fayette County, S.P. 256-A-Job 76-C, East Navidad River Bridge. Texas Department of Transportation, Records Management Division.

[12] *The Schulenberg Sticker*, 14 February 1936.

[13] *The Schulenberg Sticker*, 14 February 1936.

de Lafayette, and made La Grange, named for the Marquis' chateau, the county seat. The economy of the county rested on farming, and the abundant natural resources.[14]

The Galveston, Harrisburg and San Antonio railroad, came to Fayette County in 1873, and gave birth to the community of Schulenburg.[15] Located near the scenic East Navidad River, Schulenburg is at the intersection of U.S. Highway 77 and Farm-to-Market (FM) Road 1579, eighteen miles south of La Grange in southern Fayette County. Original settlers of the community included Germans, Austrians, and Czechs. The town took its name from Louis Schulenburg, who donated land to the railroad. Ernst Baumgarten, another land donor, opened a cottonseed-crushing plant, a lumberyard, a planing mill, a sash and door factory, and a cotton gin. He later opened the Schulenburg Oil Mill which produced Baumgarten Process Allison Oil from cottonseed. By 1884, four newspapers served the community's population of about one thousand.[16]

In the last years of the nineteenth century, desire to improve automobile travel roads inspired the Good Roads Movement. In Texas, Dave E. Colp of San Antonio, the "apostle of good roads," served as secretary of the state organization, and proved a tireless booster of Texas road building.[17] He became the first secretary of the state's Highway Commission, and then, chairman of the State Park Board from 1923 to 1935. In 1922, the same year the East Navidad River Bridge was constructed, the needs of farmers, town merchants, and touring enthusiasts came together. At a National Agricultural Conference in Washington, D.C., a resolution passed stating "country highways are the farmer's first and principal transportation means of marketing their products. They are the arteries of the economic and social system of the country." Conferees agreed improvement of farm to market roads was essential.[18] In the case of FM 1759, this also meant building a more substantial bridge over the East Navidad River.

The increased amount of tourism encouraged transportation development[19] The automobile was rapidly changing the landscape, and the interstate highway system began creeping across the national landscape. Americans began traveling the highways, and backroads

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[14] Daphne Dalton Garrett, "Fayette County," in *The New Handbook of Texas,* vol. 2 (Austin: Texas State Historical Association, 1996), 970-71.

[15] Garrett, "Fayette County." 5:930.

[16] Garrett, "Fayette County." 5:930.

[17] King, *Historical Overview*, 39.

[18] *Texas Highway Bulletin,* 2, No. 2 (February 1922): 1-2.

[19] *Texas Highway Bulletin*, 3, No. 3 (March 1923): 7.

eager to investigate the countryside. They also began demanding paved roads and stronger bridges to take them across to wherever they desired.

In 1919, in Houston, Texas, supporters of a coast-to-coast highway following a southern route met to revitalize the project. (A 1915 plan called for such a highway to begin in Florida and end in New Orleans, but World War I interrupted the project.) At the Houston meeting, changes to the route moved the Texas portion more to the South, away from Dallas, and through Houston to San Antonio and westward to El Paso, Tucson, Arizona, and San Diego, California.[20] The newly designated Old Spanish Trail would cross sections of the state followed by Spanish explorers. In Fayette County, this included State Highway 3 (S. H. 3), just outside of Schulenburg, along the East Navidad River.

At this time, the states received federal funding for highway improvement and maintenance. Texas received the largest appropriations of all the states, and boasted the greatest mileage of roads. Chief of the U.S. Bureau of Public Roads, Thomas H. MacDonald toured Texas in 1922. He encouraged the Texas Highway Department to employ more engineers, citing the "present force" inadequate.[21] Perhaps, MacDonald's scolding helped Highway Department draftsmen like Granger to receive a promotion to engineer.[22] Scholars interested in bridge design and engineering may wish to investigate further the careers of Lake Robertson, Resident Engineer on East Navidad River Bridge project, and A. T. Granger, designer of the bridge. Granger, in particular, remains a shadow figure despite his contribution to this bridge. Listed as Bridge Designer on the bridge plate, and as engineer with the Texas Department of Highways, Granger is, oddly enough listed as a "draftsman" in the employment records of the department. Since he left the project before its completion, or very near the end, it would be interesting to learn why this talented man left the department and what path his career took afterward.

In January 1922, the state hired Lake Robertson to serve as Resident Engineer on the project to build the East Navidad River Bridge. He received $29,895.22, $7,473.80 of which came from the federal government's matching funds. The new structure replacing the existing bedstead truss, plank deck, one-way wagon bridge, cost $34,777.49.[23]

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[20] *Old Spanish Trail Travelog, West Texas Edition*, ca. 1926. See also, *Texas Monthly* 5, No. 1 (January 1930): 558-60.

[21] *Texas Highway Bulletin* 2, No. 10 (December 1922): 1.

[22] Considering the short period of time Granger worked with the department, he may, indeed, have received promotion, but resigned before completion of all necessary records.

[23] Record of State Control Numbers, Sections and Jobs, Fayette County. No. 26-3-2, February 1922-October 1923.

THE NEW BRIDGE

The new bridge, opened for use in fall 1923, gave the appearance of being an arch, but is composed of cantilevered girders balanced on skewed pedestal piers. The use of cantilevered girders allowed a longer span than a simple girder and created the illusion of an arch. The angle between the roadway and river, might have influenced the decision to use a cantilever system. The moist muggy environment, so rough on deck planking and wooden structures, made reinforced concrete a good medium. The new bridge also needed to be consistent with the bucolic landscape and romance of the Old Spanish Trail as an automobile tourist attraction.

Completed in less than a year, the East Navidad River Bridge consists of three cantilever span concrete tee-beams (spans 2, 3, and 4) with two approach span concrete tee-beams (spans 1 and 5) at a forty-five degree left forward skew on concrete caps, and columns with driven timber pile foundations. The main span measures 70'-0" in length, and is flanked by two-curved cantilever arms supported on skewed concrete piers and abutments. Approach spans (one and five) measure 35'-0" each. The main span cantilevers allowed a 1" gap between the bottom of the cantilever ends and the top of the approach span supports. Granger elaborated on the placement and dimensions of the reinforcing steel in his drawings. He also cautioned: "joints shall not be made at other points than indicated on plans except with the written consent of the engineer."[24]

Likely addressing concerns about the design raised by Washington engineers, Granger wrote in July 1921: "Reinforcing shall be carefully placed in position shown on plans, and bars shall be rigidly fastened to each other and to the forms so that they cannot be disturbed during the depositing of the concrete." In another section of the drawings, Granger warns, "reinforcing must be wired very securely . . . ." Steel reinforcement has about 100 times the tensile strength of concrete. In concrete reinforced members, the concrete resists compressive forces while the steel reinforcement resists tensile forces. Properly cast in a concrete member, the steel and concrete act in harmony to create a very strong and durable construction material. In his East Navidad River Bridge, Granger used 85,780 pounds of reinforcing steel.[25]

Whereas Washington engineers worried about weaknesses in the bridge should the concrete be poured in a multi-sequenced event, Granger addressed that concern by planning for the

> pouring . . . to be continuous from end of cantilever arm at Pier 2 to construction joint near center of span B . . . [and] after concrete has set the bulkhead at this joint shall be removed and the exposed concrete surface rubbed vigorously with a wire brush and then chipped to

[24] Record, No. 26-3-2.

[25] Record, No. 26-3-2.

roughen the surface and secure as good as bond as possible. No foreign material of any sort shall be left between the concrete surfaces and the joint. Pouring shall then be continuous from the joint to the end of the cantilever arm at Pier 5. The maximum quantity to be poured at one run is about 86 cubic yards.[26]

Pier placement for the bridge varies between 11'-0" and 10'-7". Main piers vary in elevation as their placement coincided with the clay line. Pilings of untreated timber were driven to sustain a load of 20 tons per pile. Dowels and bars of varying diameter and length secured piers to main girders. At the end of the cantilever arms are expansion joints, steel plates completely independent of the concrete, and installed after the concrete fully set.
Posts in the reinforced concrete railing are of two sizes. Those above the main piers (3 and 4) are larger than those over the remaining piers. Rails, 3-1/2" between the top and bottom rail, rest in recesses that allow them to "move freely to accommodate deflection of [the]cantilever arm." Rail posts above abutment bents 1 and 6 hold the nameplates. The two nameplates are identical and located on the inside of the end rail posts at bents 1 and 6. The plate, cast in one piece of U.S. Standard Statuary Bronze, is attached at each corner with a 1-1/2" bolt screwed into the plate from the backside.[27]

Original drawings for the bridge call for a Texas Highway Department Standard wood guard fence on both sides of the road at each end of the bridge.[28] It is not clear whether or not this fence was constructed; pictures of the bridge in the 1920s do not seem to identify it. There is no guard fence at either end now.

EAST NAVIDAD RIVER BRIDGE TODAY

Today, almost seventy-seven years after construction, the East Navidad River Bridge on FM 1579 still carries traffic. The new alignment of US 90 bypassed the bridge in the 1940s, possibly helping to preserve its integrity, since heavier traffic volume, and heavier load weights are not on it regularly. Some problems do exist, however. The cantilever ends of the girders have dropped about 1"-0" to 1-.5" at Bents 2 and 5, probably because of being over-stressed by live load, and are resting on approach span supports. The approach span supports at the cantilever ends show cracking and spalling at the shear keys. Some rail members show spalling, and exposed reinforced bar. The west abutment shows cracked and spalled riprap and erosion at the toe. The West cantilever shows loss of reinforced bar, and diaphragm spalling. The substructure demonstrates scour of the channel bank exposing a 3'-0" vertical length of the

[26] Record, No. 26-3-2.

[27] Record, No. 26-3-2.

[28] Record, No. 26-3-2.

toewall, causing some undermining. Graffiti obscures the lettering on the bridge plate at the West End.

Despite these problems, the East Navidad River Bridge retains its integrity of design, materials, workmanship, location, setting, and association. A fine example of a concrete cantilever girder, with a unique open concrete railing, the bridge, stands witness to a young designers talent and artistic vision even if he were also thought of as just a "draftsman".

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